Columbia River Water Use Plan update

May 2021

We are pleased to provide highlights from the Columbia River Water Use Plan (WUP). Approved in 2007, the plan calls for a large number of monitoring programs and projects to be implemented on the main stem of the Columbia River from Kinbasket Reservoir downstream to the Canada–United States border. These projects are intended to benefit fisheries, wildlife, recreation, and archaeology.

Cover photo: Construction of the new wetland in the Arrow Lakes Reservoir drawdown zone at the Burton flats April 2021.

BC Hydro
Power smart

Fisheries

BC Hydro has been working to support indigenous fish populations in the Columbia River through a number of studies and projects delivered through the Columbia River Water Use Plan.

Fish stranding

Drops in water flows from the Arrow Lakes Reservoir have the potential to strand or trap juvenile fish in pools that form along the banks of the Columbia River. BC Hydro has responded to fish stranding in the lower Columbia River since the mid–1990's – coordinating water flow changes at the dam with field teams that survey locations where pools form to search for stranded fish. Fish are collected from pools using dip nets, seine nets, and electrofishing. Once captured, the fish are safely moved back into the Columbia River.

Formal studies to find locations with the highest risk of stranding began in 2000 and Water Use Plan studies continued this work from 2007 through to 2020. During the last fiscal year (April 1, 2020 to March 31, 2021), teams used the nearly 20 years of past data to guide where and when to search for pools and fish. Teams completed a total of 16 fish stranding surveys during Arrow Lakes Reservoir flow changes and successfully returned over 5,000 fish back to the mainstem Columbia River. Results from last year will be used to update the protocol that guides BC Hydro's fish stranding responses. In addition, fish stranding results will be combined with riverbed data collected in 2021 to better predict where fish stranding may occur.

Riverbed recontouring

In March 2021, we recontoured the river bottom at the Genelle Main Bar to reduce fish stranding. This site is located adjacent to the community of Genelle, approximately eight kilometres downstream from Castlegar.

We used the existing sediment on site to fill in two existing stranding pools, and finer sediment was capped using larger sediment to minimize future erosion at the site. Backhoes were used to fill in depressions and the area was then smoothed out with graders. This work will protect fish from being stranded at this site by preventing water from pooling following Arrow Lakes Reservoir flow reductions.

Before the recontouring work began, we set up fencing to prevent Rainbow Trout from accessing spawning sites in the project area to avoid impacting early deposited redds. We have completed recontouring work in the past at both Genelle Islands and Norns Creek Fan that successfully reduced fish stranding at those locations.

Field crew electrofishing to capture stranded juvenile fish in pools near Norns Creek Fan. Photo Credit: Kevin Little

Before: Photo of Columbia River near Genelle at low flows showing shallow pools where fish can be stranded.

After: Photo of same area after recontouring project to eliminate the pools.

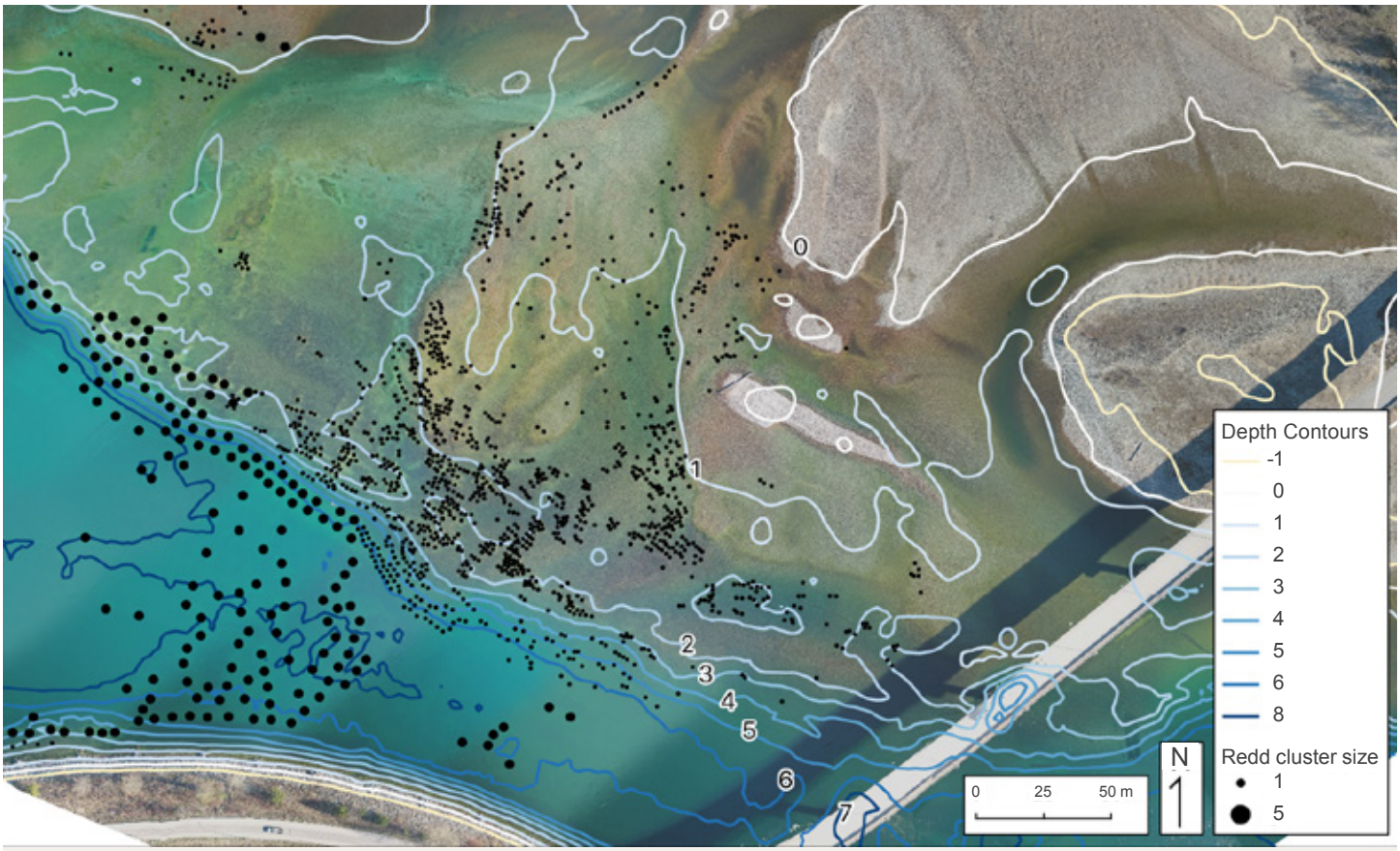
Fish population indexing

We continued the Lower Columbia River fish indexing program again in 2020, marking 13 years of our annual fish population surveys under the Water Use Plan. Key species we monitor include Rainbow Trout, Mountain Whitefish, and Walleye.

Rainbow Trout spawning studies

We also completed our Rainbow Trout spawning assessment studies again in 2020. This is another program that began in 2007. Rainbow Trout are a key sportfish in the mainstem Columbia River and typically spawn in the Lower Columbia River from March until June. Key mainstem spawning areas below the Hugh L. Keenleyside Dam are Norns Creek Fan and near Genelle.

Due to the COVID pandemic, we used drone surveys in 2020 to photograph key spawning locations in addition to traditional helicopter–based surveys. Water clarity was excellent, and the drone photographs provided clear photos of spawner locations or 'redds' dug by the spawning trout. Based on this success, we're planning to use both drone and helicopter surveys again in 2021.



A drone photograph of Norns Creek Fan, just upstream of the Castlegar–Robson Bridge. The black dots show spawning locations of Rainbow Trout.

Rainbow Trout spawning protection flows

Rainbow Trout eggs can be vulnerable to reductions in water flows until the fry hatch about six to eight weeks after the eggs are deposited. This vulnerability depends on a number of factors including weather conditions, substrate, and duration of exposure to air (dewatering).

The Rainbow Trout spawning protection flows provide stable or increasing flows from April through June. Flows are also lowered at the end of March, prior to the peak spawning period, to encourage Rainbow Trout to spawn in lower elevations. This minimizes the chance that incubating eggs might be dewatered.

While the results to date have shown that the Lower Columbia Rainbow Trout adult population has increased since 2007 flows, it is unclear if this is a direct result of the protection flows which have been in place since the early 1990's or another factor. Concurrently, there has been a trend of declining body condition in Rainbow Trout adults and subadults.

Juvenile Rainbow Trout. Photo Credit: Chris King

Starting in 2019, we're now alternating between years of protection flows and no protection flows. This experimental approach will improve our understanding of the direct effects of these flows on the adult Rainbow Trout population in the Lower Columbia River. In 2019, we dewatered 0.7% of redds deposited and in 2020, we dewatered 1.1% of redds. At this low level of redd dewatering, we are unlikely to detect a population level effect on rainbow trout; however, we did learn from this experiment that the level of mortality experienced in dewatering is significantly less than the original assumption of 100% mortality immediately upon dewatering. In 2021, we have negotiated the provision of Rainbow Trout spawning protection flows and next year (2022) will be an 'off' year where we'll carefully monitor the survival of Rainbow Trout eggs at specific locations once again.

If study results demonstrate that the protection flows provide significant benefits to the adult Rainbow Trout population, they will be considered for further implementation. A technical forum that includes regulatory agencies, First Nations, and BC Hydro representatives will reconvene each year to review results and plan for next year. The study and the technical forum are planned for up to five years, ending in 2023.

White sturgeon

We're continuing our work with First Nations, stakeholders, federal and provincial government partners, and other industries through the Upper Columbia White Sturgeon Initiative to help restore Upper Columbia River white sturgeon. The white sturgeon population in the Canadian portion of the Columbia River was listed as endangered in 2006 under the Species at Risk Act due to recruitment failure where an insufficient number of young survive to become mature adults. We've been delivering a wide range of long–term monitoring studies under the Water Use Plan to learn more about sturgeon and their spawning and recruitment. We're focusing on two segments of the sturgeon population– those living below the Hugh L. Keenleyside Dam (HLK) and those living above the dam in Arrow Lakes Reservoir.

A conservation aquaculture program was initiated in 2001 to prevent extirpation and restore a natural age class structure in the population. Hatchery–origin juvenile sturgeon have been released annually into the Columbia River below Hugh L. Keenleyside Dam since 2002 and into Arrow Reservoir since 2007. The conservation aquaculture program has been continually adapted based on new information and in recent years, wild eggs and larvae have been collected from the Columbia River and raised in a hatchery. This approach helps to maintain the genetic diversity of the wild population by allowing wild adults to reproduce naturally and then their offspring are released back into the river at an age and size where they survive better. Overall, the aquaculture program has been very successful downstream of Hugh L. Keenleyside Dam where monitoring shows that more of the young fish have survived than originally expected. Accordingly, we have gradually decreased the number of fish we raise and release each year. Above the Hugh L. Keenleyside Dam in Arrow Lakes Reservoir, success has been more difficult to determine as there have been fewer recaptures of released fish. We're now releasing larger fish into Arrow Lakes Reservoir in hopes of improving survival. In 2021, we'll be releasing young sturgeon below the Hugh L. Keenleyside Dam and sturgeon above the dam in Arrow Lakes Reservoir at Shelter Bay.

We are continuing assessments that estimate the number of wild white sturgeon remaining in the Columbia River between the Hugh L. Keenleyside and Grand Coulee Dams. The current

estimate for the Canadian portion of the Columbia River is approximately 1,100 wild adults, with more than 5,500 hatchery–origin sturgeon at large.

Through our work we have learned that sturgeon spawn from June through August at multiple spawning locations in the Canadian Columbia. Known spawning sites are downstream of Hugh L. Keenleyside and Arrow Lakes Hydro, near Kinnaird, and downstream of Waneta Dam. Upstream of the Hugh L. Keenleyside Dam one spawning location has been identified near Revelstoke Dam. At these sites we are continuing to monitor spawning activity to determine how conditions influence the timing of spawning and the frequency each site is used. We're also using genetic techniques to analyze tissue samples from fish born at different spawning sites to estimate the number of wild adults contributing to spawning events at the different sites. This information will help us continue to refine our conservation aquaculture program.

While the specific cause of white sturgeon recruitment failure is still being investigated, changes to substrate conditions at spawning sites from dam construction and river regulation has been identified as an area where restoration could have a positive effect. BC Hydro commissioned a study in 2017 to better understand current substrate conditions and to assess the feasibility of restoration options that would likely benefit white sturgeon. We have identified a location downstream of Arrow Lakes Hydro where making changes to the substrate may improve survival of larval sturgeon. We are currently working on a proposed design and construction methodology.

Reservoir productivity

We're preparing final reports for productivity studies that collected data on Kinbasket Reservoir and Revelstoke Reservoir from 2008 until 2019. These studies focus on learning how reservoir aquatic food webs work and whether we could make changes to our reservoir operations to improve biological production. The food web starts with nutrients, such as phosphorus and nitrogen. Nutrients are made available to phytoplankton (algae) and then move up the food chain to zooplankton and kokanee. The data collected by the studies are combined with other large reservoir information to help investigate the influence of both operational and regional productivity drivers.

Spawning Kokanee in Bush River (Kinbasket Reservoir) Photo Credit: Karen Bray

Revelstoke Dam Minimum Flow

We have been maintaining a minimum flow from Revelstoke Dam since December 2010 to benefit fish and fish habitat when we started operating the newly installed fifth generating unit. The minimum flow is 142 cubic metres per second (5,000 cubic feet per second) and we typically maintain flows well above that level to prevent cavitation damage to our turbines.

That stretch of river is used by at least ten fish species. The most common are Mountain Whitefish, Bull Trout, Kokanee, Suckers, and Sculpins. There are also some Rainbow Trout and Northern Pikeminnow and occasionally Burbot, Lake Whitefish, and White Sturgeon are also observed.

We recently completed all studies, most of which started in 2007. The main objectives were to detect whether the minimum flows provide the expected benefits to the fish community. To do so, we monitored variables ranging from water temperature, water levels, nutrients, benthic productivity, and fish communities in the stretch of the Columbia River from the dam to the Illecillewaet River confluence approximately 12 kilometres downstream. The data further allowed us to develop habitat suitability indices particular to the local species and a bioenergetics model focusing on Bull Trout and Mountain Whitefish.

The results do not show that the minimum flow has resulted in any biologically significant changes to fish distribution, growth, or diversity. While implementation of the minimum flow at the same time as Revelstoke 5 makes it hard to dissociate the two types of effects, the resulting dataset provides a thorough baseline to understand the fish community that uses that stretch of river.

View of Columbia River downstream of Revelstoke Dam. Photo credit: Jen Walker–Larsen

Wildlife habitat enhancement

Burton flats wetland

This spring, we completed construction of a wildlife enhancement project on 6.5 hectares of land in the drawdown zone of Arrow Lakes Reservoir at the Burton Flats. We created primary shallow tiered wetlands, a secondary shallow disconnected wetland, two deep waterfowl ponds, and drainage channels to connect the wetlands to the existing gravel pond and the reservoir. We used the excavated material to build wildlife habitat and planting mounds.

A bumblebee forages on a recently planted willow shrub at the new Burton flats wetland. Photo Credit: Mike Miller

Having a mix of ponds fed from groundwater and from the reservoir will provide a wider range of habitat for wildlife and plants. These wetlands are intended to remain "in the wet" even when the reservoir water level is drawn down, providing 1.7 hectares of new wetland habitat year–round. Kingfishers, larkspurs, and elk have already been observed using the newly constructed wetland and this spring we've also observed amphibian breeding. We will finish planting native vegetation on the new planting mounds in fall 2021.

The new wetland area adjacent to Highway 6 is at an early developmental stage and will take some time to establish.

If you are recreating on the Arrow Lakes Reservoir flats near Burton please avoid this sensitive wetland area.

A mass of Columbia Spotted Frog eggs in the new Burton flats wetland spring. Photo Credit: Mike Miller

Bat roosting

We're working to enhance bat habitat in Arrow Lakes Reservoir. We've installed artificial bat roosting structures next to the reservoir flats south of Revelstoke and next to the new Burton wetland.

Providing artificial roosting structures offers additional secure summer roosting habitat for local species such as Little Brown Myotis, Yuma Myotis, and Northern Myotis. These roosts might help reduce stressors on local bat populations, increase resilience to white–nose syndrome, and support recovering populations.

We've installed several types of bat roost structures in the area to enhance bat roost availability. All made locally in Nakusp, we're using four different structures—artificial bark poles, multi–chambered maternity boxes, rocket boxes, and a mini–condo. Roosting bats need temperatures no higher than 45 degrees Celsius and having several types of bat roost structures available within an area will allow roosting bats to move within and between structures.

Bat roosting structures installed next to the Arrow Lakes Reservoir flats south of Revelstoke. From left to right a mini condo, a rocket box, a maternity box, and a bark pole. Photo Credit: Jen Walker–Larsen

We'll be monitoring these roosting structures for five years to learn more about local bat species and how they use the structures. Each roosting structure is equipped with sensors that continuously monitor temperature within the structure. During periodic visits to the structures, crews will collect data on bat usage and timing of emergence and collect bat guano from below the roosts for DNA analysis. The DNA analysis will tell us what bat species are using the structures. All crew members will follow disinfection protocols to avoid spreading white–nose syndrome spores.

Bush Arm debris mounds

Full pool Kinbasket Reservoir water levels in 2020 tested the debris mounds we built in fall 2015 near the Bush Arm causeway. A short field check in fall 2020 determined that the mounds partly withstood the extended high reservoir water levels, wave action, and associated log abrasion. In early summer, we'll have a post–flooding monitoring session to assess any changes to the debris mounds and vegetation in more detail.

Bush Arm and Canoe Reach debris booms

The high Kinbasket Reservoir water levels in 2020 also allowed us to assess whether floating log debris booms we installed at Bush Causeway and near the north end of Canoe Reach were effective in excluding floating wood debris. We installed the log debris booms several years ago after woody debris removal at these sites by our debris contractor was followed by a positive response in vegetation growth and diversity of plants.

Top of debris mound visible above high 2020 Kinbasket Reservoir water level. Photo credit: Mark Sherrington

The Bush Causeway boom failed due to a rotten log 'boom stick' and wood debris floated into the enclosure. The debris contractor promptly removed all the accessible floating wood and repaired the boom. The Canoe Reach log boom, although slightly damaged before the high water, did successfully stop floating wood from entering that enclosure.

To further protect wetland habitat in the Valemount Peatland and meet reservoir recreation objectives, large amounts of accumulated woody debris was removed from several kilometres of the drawdown zone between November and January 2021 in the upper part of Canoe Reach.

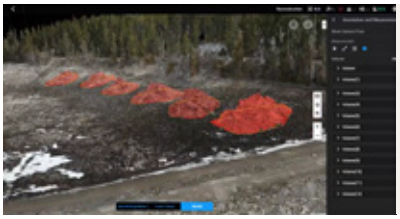
Valemount peatland

This study's main objectives are to assess whether erosion is increasing or decreasing in the Valemount peatland and the primary causes of any observed erosion. A preliminary study conducted in 2008 concluded that erosion processes were directly related to Kinbasket Reservoir operations, although it would take 2,000 years to erode the entire site at the observed rates. We are evaluating if the current study (using the most recent available aerial surveys) can be used to better understand the erosion mechanisms and determine to what extent these are influenced by reservoir operations. Aerial photography flown in 2019 and a field assessment of the peatland has provided preliminary indications that reservoir operations are removing peatland material at lower elevations but at upper reservoir elevations the peatland remains functional. This could be due to a shorter inundation periods at upper elevations with a longer effective growing season for plants to maintain peatland function. The next aerial photography will be flown in 2024 to assess any changes to the peatland.

Woody debris removal

We're continuing to meet with Debris Management Committee members in Castlegar, Nakusp, Revelstoke, Golden, and Valemount to plan and prioritize our floating woody debris removal work for Kinbasket and Arrow Lakes Reservoirs. Removing floating woody debris is an important part of improving recreational opportunities for those reservoirs and since 2007 we've funded close to $8.9M of debris work that has removed over 319,500 cubic metres of woody debris from Kinbasket Reservoir and over 84,795 cubic metres from Arrow Lakes Reservoir.

We've recently made improvements to our debris inventory methodology. In the early days of the program we conducted aerial surveys of the reservoirs and staff visually estimated volumes of wood remaining at the main debris accumulations. In 2019 we tested an alternative approach where we captured multi–view aerial photos during flights instead. Using stereo photogrammetry, we can view the photos in three dimensions and more accurately estimate wood volumes. Using this technique, we have updated our debris inventory for Arrow Lakes Reservoir and are working to update our inventory for Kinbasket Reservoir.



Screenshot of Picterra computer software that uses perimeter distance of each debris pile to calculate the volume of wood.

For Arrow Lakes Reservoir, we focused our efforts last year (2020) around Syringa Park and Scotties Marina and then moved north to Windy Point, Anderson Point, and Sunshine Creek. We also removed approximately 4,500 cubic metres of woody debris in 2020. This year's Arrow Lakes Reservoir work will focus on the lower reservoir. Work will start at Hutchinson Creek and Van Houten Creeks and then crews will work their way north towards Octopus Creek, Needles, Beaton Arm, and the McDonald Creek Park boat ramp area.

On Kinbasket Reservoir, we removed 58,000 cubic metres of debris in 2020. This year, we plan on removing debris from the Horse Creek recreation area south to Valemount Marina as well as in the Columbia Reach area, including Bush Arm, Sullivan, and Gold River. Crews will also remove debris from high priority areas identified for the entire reservoir by the Golden and Valemount Debris Management Committees.

Kinbasket debris.

Debris boom at night.

We're continuing to coordinate our Kinbasket and Arrow debris removal work with our Reservoir Archaeology Program (RAP) in both reservoirs to protect heritage and archaeological sites. The RAP is an archaeological inventory program underway in Kinbasket Reservoir and Arrow Lakes Reservoir to identify and record archaeological sites within the active erosion zone. Although we have repeatedly used many of our debris management locations in the past, this coordination ensures that any ground disturbance caused by our debris management work is managed according to our best management practices for heritage and archaeological resources.

Boat ramps

We've built new ramps and made improvements to existing ramps at two sites on Kinbasket Reservoir and eight sites on Arrow Lakes Reservoir from 2008 to 2016. These new and refurbished ramps will provide area boaters with safe and improved access for many years to come.

Shelter Bay Provincial Park boat ramp. Photo credit: Jen Walker–Larsen

New boat ramp upgrades

Recently we've been working to make some repairs to existing boat ramps on Revelstoke Reservoir. In 2019, we removed sediment that had built up on the end of the paved boat ramp at the Downie Creek Recreation Site boat ramp and removed shoreline woody debris. We have work planned for the boat ramp at Martha Creek Provincial Park in fall 2021 once the park is closed for the season. We'll address a depression in the gravel toe of the existing concrete ramp that makes boat launching difficult at low reservoir water levels and we'll replace the floating walkway.

Boat ramp use study

We ran a Boat Ramp Use study for ten years from 2010 until 2020 to help us understand how user satisfaction, as well as volume and frequency of ramp use, has changed with the boat launch upgrades throughout Arrow Lakes and Kinbasket Reservoirs. We monitored the traffic using the boat ramps and conducted periodic face–to–face interviews both before and after the upgrades occurred. While we are awaiting a comprehensive final report that summarizes study results, interim results suggest that user satisfaction has significantly increased with the upgrades while the change in volume of public use is mixed. Some sites experienced an increase in volume of public use while other sites saw a decrease or no change in volume.

Arrow Lakes and Kinbasket Reservoir boat ramp elevations				
Location	Elevation of ramp toe		Lowest operational water level*	
	Metres	Feet	Metres	Feet
Arrow Lakes Reservoir				
Syringa Creek	421.87	1,384.08	422.87	1,387.37
Anderson Point	425.00	1,394.30	426.00	1,399.02
Edgewood	425.76	1,396.70	426.76	1,400.13
Fauquier	424.66	1,393.24	425.66	1,396.52
Burton	425.40	1,395.67	426.40	1,398.95
McDonald Creek	426.00	1,397.64	427.00	1,400.92
Nakusp Boat	420.50	1,379.59	421.50	1,382.87
Shelter Bay	422.86	1,387.34	423.86	1,390.62
Kinbasket Reservoir				
Bush Harbour	724.60	2,377.30	725.60	2,380.58
Valemount Marina	727.59	2,387.11	728.59	2,390.39

*Operational according to the following boat dimensions: 9.3 metre length, 3.1 metre width, 1 metre maximum draft (amount below waterline), and maximum weight of 4 tonnes.

Arrow Lakes Reservoir soft constraints performance 2020

Soft constraint	Target	2020 performance
Recreation	Reservoir water levels between 1,435 feet and 1,440 feet preferred during the summer recreation season. Reservoir water level above 1,424 feet acceptable given boat ramp improvements.	The reservoir water level was between 1,435 and 1,440 feet 45% of the time during the recreation season (May 24 to September 30) and above 1,424 feet 84% of the time.
Wildlife	Ensure inundation of nesting bird habitat by rising reservoir levels and availability of fall migratory bird habitat is no worse than recent average (1984–1999). Target a reservoir level of 1,438 feet or lower by August 7.	Arrow Lakes Reservoir was below 1,424 feet for about 40% of the time between April 30 and July 16. This resulted in below average conditions for nesting birds. The reservoir was below 1,438 feet for 100% of the time between August 7 and October 31 for fall migratory birds.
Fish	Reservoir levels above 1,424 feet to ensure tributary access during kokanee spawning period from late August to early November.	Arrow Lakes Reservoir was above 1,424 feet for about 69% of the time between August 25 and November 15.
Vegetation	Maintain current (2004) level of vegetation in the drawdown zone by maintaining lower reservoir water levels during the growing season.	Reservoir was below 1,424 feet for 30% of the time between May 1 and October 31.
Erosion	Minimize duration of full pool events and avoid sudden drawdown once full pool has been reached to avoid shoreline slumping. Reservoir water level of 1,440 feet is ideal.	The reservoir reached a peak level of about 1,442.6 feet on July 2, about 1.4 feet below full pool. Due to a return of drier summer conditions, the Columbia system was operated in proportional draft for the balance of summer. For this reason, the reservoir drafted to about 1,429 feet on August 31 and 1,422 feet on September 30.
Culture and Heritage	The original target was 'reservoir levels at or below 1,430 feet for as long as possible to limit impacts to archaeological sites'. During the five–year interim review of the Arrow soft constraints, this target was determined not to be effective due to the presence of 102 archaeological sites at elevations below 1,430 feet.	BC Hydro is implementing a multiyear Reservoir Archaeology Program (RAP) in the Upper and Lower Arrow Lakes to inventory heritage sites and identify impacts as a result of normal reservoir operations. Information gathered by the RAP is expected to assist future decision makers and development of an Archaeological Management Plan.

HOW TO GET MORE INFORMATION

Copies of the Columbia River Water Use Plan, study terms of reference, reports, performance measures, Columbia River WUP Consultative Committee report, and other water use planning information are available at: **bchydro.com/about/sustainability/conservation/water_use_planning/southern_interior/columbia_river.html.**

Questions? Please get in touch.

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McDonald Creek Provincial Park boat ramp. Photo credit: Jen Walker–Larsen

Completed projects

Shelter Bay Park boat ramp upgrades (Arrow Lakes Reservoir)
Nakusp boat ramp replacement (Arrow Lakes Reservoir)
MacDonald Creek Park boat ramp upgrades (Arrow Lakes Reservoir)
Burton boat ramp construction (Arrow Lakes Reservoir)
Fauquier boat ramp upgrades (Arrow Lakes Reservoir)
Edgewood boat ramp upgrades (Arrow Lakes Reservoir)
Syringa Park boat ramp upgrades (Arrow Lakes Reservoir)
Anderson Point boat ramp construction (Arrow Lakes Reservoir)
Bush Harbour boat ramp construction (Kinbasket Reservoir)
Valemount Marina boat ramp upgrades (Kinbasket Reservoir)
Cartier Bay wetland protection project (Revelstoke)
Airport Slough wetland protection project (Revelstoke)
Revegetation planting (Arrow Lakes Reservoir)
Sturgeon hatchery upgrade (mid-Columbia River)

Completed studies

Recreation demand study (Arrow Lakes Reservoir)
Woody debris removal environmental review (Kinbasket, Arrow Lakes Reservoir and Lower Columbia River)
Woody debris inventory, management strategy and removal (Kinbasket and Arrow Lakes Reservoir)
Feasibility of boat ramp improvements (Kinbasket, Arrow Lakes, mid-Columbia River and Lower Columbia River)
Indian Eddy dredging engineering and environmental review (Lower Columbia River)
Erosion protection and monitoring (mid-Columbia River)
Erosion long term monitoring (mid-Columbia River)
Inventory of vegetation resources (Kinbasket and Arrow Lakes Reservoir)
Juvenile fish stranding study (mid-Columbia River)
Bull trout monitoring program (Kinbasket Reservoir)
Rainbow trout monitoring program (Kinbasket Reservoir)
Burbot life history (Kinbasket and Arrow Lakes Reservoir)
Macrophyte study (Revelstoke Reservoir)
Nagle Creek wetland study (Revelstoke Reservoir)
Wetland vegetation study (Kinbasket Reservoir)
Sturgeon spawning habitat assessment (mid-Columbia River)
Sturgeon incubation and rearing study (mid-Columbia River)
Effects of Revelstoke 5 flow changes on incubation of sturgeon (mid-Columbia River)
Sturgeon inventory and habitat use (Kinbasket Reservoir)
Sturgeon recolonization risk assessment (Kinbasket Reservoir)
Spawning fish tributary access study (Arrow Lakes Reservoir)
Sculpin and dace study (Lower Columbia River)
Rainbow trout spawning study (Lower Columbia River)
Whitefish spawning study (Lower Columbia River)
Whitefish egg monitoring study (Lower Columbia River)
Great blue heron study (Lower Columbia River)
Nest mortality of migrating birds (Kinbasket and Arrow Lakes Reservoir)
Neotropical migrant bird use study (Arrow Lakes Reservoir)
Shorebird and waterbird monitoring study (Arrow Lakes Reservoir)
Amphibian and reptile monitoring study (Kinbasket and Arrow Lakes Reservoir)
Heritage monitoring wind and wave erosion study (Arrow Lakes Reservoir)
Archaeological overview assessment (Kinbasket, Revelstoke, and Arrow Lakes Reservoir)
Juvenile fish habitat use (mid-Columbia River)
Inventory of mosquito populations (Revelstoke area)

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